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ABSTRACT

Reported are results of a project carried out at the Swedish Institute for the Handicapped to determine needs of the visually impaired in the planning and adaptation of buildings and other forms of physical environment. Chapter 1 considers implications of impaired vision and includes definitions, statistics, and problems of the visually impaired such as orientation. Chapter 2 given basic information on building site, planning and design, the use of furnishings, obstacles, light, color, and sound. Considered in the third chapter is the total environment of the visually impaired individual including primary buildings (such as homes), the environment between buildings, secondary buildings (such as schools and shops), and public transport. The design of special small scale environments including areas for hygiene, changing, housework, meals, specific types of work, and vertical transportation is discussed in chapter 4. The final chapter gives additional information on lighting, signs and sign-posting, and design of doors and gates. Summarized are important points of the booklet such as breaking down large areas into smaller areas and complementing optical signals with acoustic signals. (DB)

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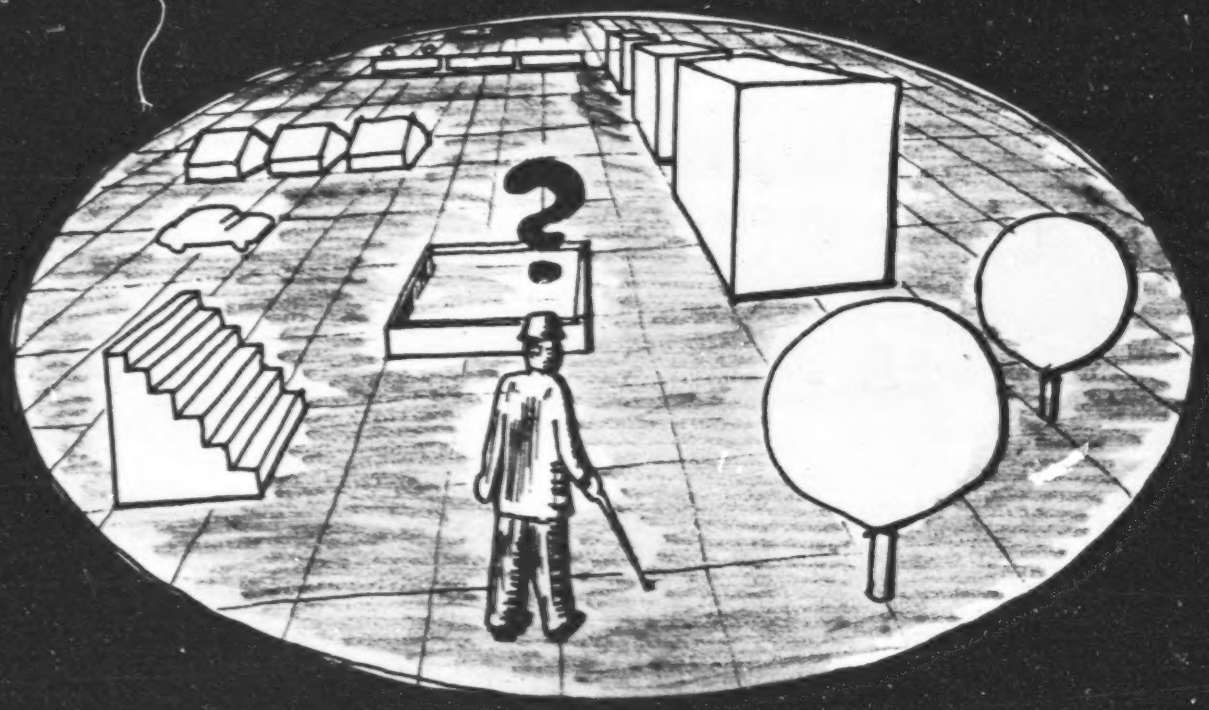

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INTRODUCTION

There is much to be done in a number of different fields in order to enable people with impaired vision to function in society. It is important that suitable technical aids are made available, but at the same time one should, as far as possible, plan and adapt the physical environment to suit the special requirements of the visionally handicapped.

Comparatively extensive research has been carried out as far as personal technical aids are concerned, but surprisingly little has been done to improve the physical environment. In fact it appears to be only during recent years that any research at all has been carried out and that any noticeable interest has been shown by the various environment planners. This does not imply that knowledge or opinions are lacking: naturally, people with poor vision have always had opinions as to how the physical environment should be formed.

This publication is the result of a project carried out at the Swedish Institute for the Handicapped. The aim was to find out what demands people with impaired vision have regarding their immediate and peripheral environment.

The investigation consisted of interviews and discussions both with people with severely impaired vision and with various specialists. Existing literature on the subject has been collected and studied and relevant documents have been listed.

Mainly due to the lack of adequately specified demands the publication cannot be classified as a book of instruction. Its aim is rather to inform about existing problems, to give basic starting material for the planning and design process and wherever possible, to suggest possible solutions. The publication is primarily intended for architects and environment planners but can also be useful to others who are interested in handicap questions. Some of the problems which have been uncovered show that research must be initiated. Certain research is however already in progress. It is to be hoped that this publication will lead to measures being taken to improve the physical environment for people with severely impaired vision and at the same time stimulate discussion and continued work within the field. We shall welcome any comments regarding the publication, and suggestions in general.

The project-leader was Architect Per-Gunnar Braf. He was assisted by a working-group composed of the following members – Gösta Christensson (The Swedish Association of the Blind, Stockholm), Per-Olov Nisses (The Swedish Association of the Blind, Stockholm), Gunnar Petersson (The Swedish Association of the Blind, Stockholm) and Sune Währner (advisor regarding work rehabilitation of the visually impaired).

Also attached to the project was the following project-group – Anders Arnör (The Swedish Association of the Blind, Stockholm) Lennart Georgii (The Swedish Institute for the Handicapped), Lars-Erik Henricsson (industrial designer) – who is also the author ot the section on light – Krister Inde (teacher, rehabilitation of the visually impaired), Jan-Ingvar Lindström and Peter Lorentzon (The Swedish Institute for the Handicapped), Bill Pardon (architect), Gerd Rosenberg (building ingineer) and Roy Strömblad (The Swedish Association of the Blind, Gothenburg).

The members of both groups were chosen with regard to their experience in the planning of the physical environment. Several of the members, with severely impaired vision, where particularly qualified project.

Since the publication is intended for readers with different interests and backgrounds, some comments on its disposition and contents seem to be appropriate.

There are very many different environments, and many details in each environment. A publication dealing with all possible combinations of these details would be much too comprehensive. This publication has rather to be regarded as a handbook or manual, where the reader chooses the section or combination of sections of particular interest to him.

The contents are divided into basic information, and more detailed information. Between the two types of material there is a reference system partly consisting of important basic principles, partly of headings which are repeated. The references also act as a kind of check list of various factors to which attention should be paid.

Chapter 1 begins with a general description of the implications of impaired vision, including definitions, statistics, different types of problems regarding vision, different means of orientation, and orientation ability etc.

Chapter 2 presents the basic and general problems involved in planning for people with impaired vision. Some suggestions for general solutions are also given. The total environment, subdivided into some main types is described in the third chapter. In this chapter, important passages and special or characteristic problems and solutions are repeated. Certain "part-environments" which occur in the majority of buildings are dealt with in chapter 4. Here also certain important passages are repeated, but the chapter deals mainly with special and characteristic aspects of different "part-environments". Chapter 5 develops certain sections more in detail. Finally, follow »Important points» and the »Word Index».

Jan-Ingvar Lindström

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IMPAIRED VISION – WHAT DOES IT IMPLY?

In our society there are many people who are more or less excluded from the information conveyed by the eye. The problems which arise in the course of contact with the physical environment are greater for these people than for others. A person who can see may have some difficulty in moving around in an unfamiliar environment. For someone with impaired vision it is much more difficult to move about in environments with which he is not familiar. Even in familiar environments it can be difficult for a person with impaired vision to locate where he is and to manoeuvre at "short-range" - to avoid an open cupboard door, for example. To move about and orientate oneself in the physical environment is here called *orientation.*

> By planning and forming the physical environment in such a way that it is also suitable for persons with impaired vision one makes daily life easier for everybody.

Impaired vision

In this publication the concept "impaired vision" is used. This is a broader concept than "poor vision" (severely impaired vision or blindness, and problems with vision), and covers even other grades of impaired vision. This concept also comprises what could be called "acute blindness", that is to say a tempo ry worsening of vision which can take place for example if the s are out of order, or if one has forgotten ones glasses.

How many people have poor vision?

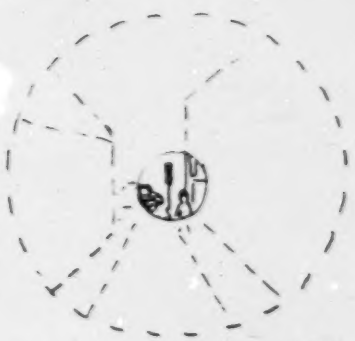
It is impossible to arrive at an accurate figure as to how many people have problems with their eyesight.

According to a register kept by The Swedish Association of the Blind, approximately 18 000 persons in Sweden over 16 years of age have poor vision.

Sharpness of vision can vary between 0,0–1,0. It has been estimated that 7 % of the Swedish population between the ages of 15 and 75 maintain that they have problems with their eyesight which is not appreciably helped by wearing glasses. This gives a total of 430 000 people of whom 160 000 claim to have severe problems with their eyesight. In addition to those mentioned above there are of course many others who do not have maximum sharpness of vision.

The number of persons with impaired vision is increasing due to the increase of certain diseases, e.g. diabetes.

The degree and character of impaired vision thus vary considerably from case to case and so does the ability to "orientate" – to move around and to function in different situations.



Severely impaired vision – orientation

People with severely impaired vision can in general move around without help in environments with which they are familiar. It becomes more difficult in unfamiliar environments.

A person with severely impaired vision can move around on his own in certain circumstances, but in general he must use some form of aid, such as a long white *stick*. By moving the stick to and fro in front of oneself one can detect obstacles and objects which are in one's way and thereby avoid bumping into them. The stick can of course only give warning regarding objects below waist-level and in the immediate vicinity. It is difficult to detect hanging or projecting objects with a stick. One can also use a *guide-dog*. A well-trained guide-dog can detect and avoid both objects which are in one's way, and hanging or projecting objects. When a person with severely impaired vision is together with other people in an unknown environment, the most common method is for one of the others to *lead* him. The person with poor vision grasps the other person lightly by the elbow, and walks half a step behind him. In this way he gets information regarding stairs, pavements etc and avoids obstacles.

Sound is also an aid to orientation. In certain circumstances smells, contrasts in temperature etc, can also give directional guidance. As to functioning close at hand – for example to locate door-openings – the person with severely impaired vision relies mainly on his sense of touch, or hearing.

Others with problems regarding vision – orientation

People with poor vision, people who can distinguish certain details in their environment but not everything, and people with impaired vision, are a very heterogeneous group.

Above all, different persons' ability to use their power of vision varies greatly. This is naturally partly due to sense of direction and habit, but it is also due to the fact that there are many different types of impaired vision.

People who have problems with their sight may have a limited field of vision and varying length of vision. One may be sensitive to dazzling, but at the same time require a lot of light.

Certain people have little possibility to fix their gaze, to see at a distance, to read signs and to distinguish corners lacking in contrast. Others are night-blind, or cannot see to the side, neither up nor down. They therefore often use stick-technique when moving about.

People with normal vision need well-planned lightning - and colour - schemes in order to be able to function well and to achieve a favourable appreciation of their surroundings. For people who have problems with their vision it is even more important that lighting – and colour-schemes should be planned with a knowledge of their handicap. The conditions of vision for those who have problems with their eyesight are complicated by a number of factors which

are related partly to the defect in vision, and partly to the aids which are used. Because of diminished light in the eye and in the optical aid, people with vision problems require more light. The difficulties which can arise for these people are often due to the fact that they have a limited field of vision, are very sensitive to dazzling, and are dependent on a short reading distance.

What can be done?

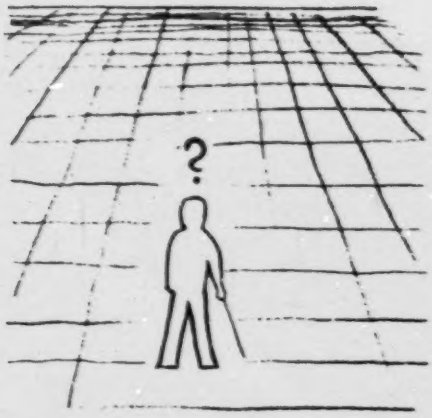
There are several ways in which one can make orientation easier for people with impaired vision. In addition to what can be done within the normal course of physical design, such as planning solutions, one can make orientation easier for the totally blind by using contrasting surface materials etc. For those who have problems with their eyesight one must also pay special attention to the use of light, colour, signs and sign-posting.

Technical aids can also facilitate orientation. These aids can be personal (binocular glasses), or be part of the physical environment (sound beacons). Except in one or two cases technical aids will not be discussed hereafter.

It is important that as early as possible – as early as at the sketch-design stage – consideration is paid to the demands of people with impaired vision on the physical environment. Many problems can be diminished or completely eliminated at that point. The costs will also be normal if the necessary adaptations are carried out at an early stage. The question of extra costs will only arise in the case of exceptions. Solutions, adapted to suit the demands of those with impaired vision, will even be less expensive sometimes. An element of a building, if correctly placed, will not for example afterwards require a safety-rail added to it.

One can find support for the suggestions made in this publication in the Workers' Protection Act and in The Building By-laws 42 a §, which reads as follows:

> The Building By-laws 42a§
> The parts of buildings to which the general public has the right of access or which are used as work premises should, to a reasonable extent, be designed so as to render them accessible and usable to persons whose mobility or orientational capacity is handicapped by age, invalidity or sickness.



BASIC INTRODUCTION

Orientation in the modern community is becoming more and more difficult for people with impaired vision. This is a result of, amongst other things, increased urbanisation with large buildings and heavy vehicular traffic. Personal service is no longer so common. The local shop has often been replaced by the shopping-centre. The number of signs has increased and it has become more difficult to obtain verbal information and personal help.

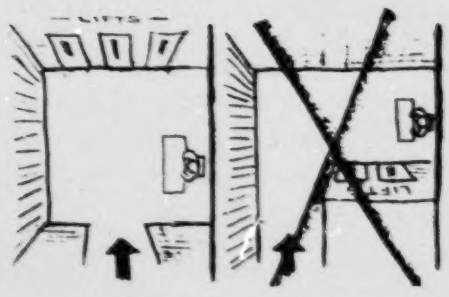
It is important to remember that many things which do not normally create big problems can be difficult and sometimes even dangerous for people with impaired vision. This applies for example to the unexpected placing of objects and details in the physical environment, wrong planning solutions, and unexpected events such as snow-clearing, street-cleaning and roadworks.

To eliminate the difficulties for someone with impaired vision as far as orientation is concerned *the siting* and *planning solutions* must be simple and easily understood. One should bear in mind the person with impaired vision when choosing *furnishings* and *fitments*. For example one can use contrasting materials and place furniture and fitments so that they do not get in the way. Sufficient *information* regarding the environment in which one will be moving about is a basic requirement for orientation. *Light*, used in the right way, simplifies orientation. *Colour* can be of decisive importance in distinguishing different parts of the environment. Finally, *sound* can make orientation both easier and more difficult.

Siting

The larger the area one has to move over, the more difficult orientation becomes. Orientation is also more difficult if one frequently has to change direction.

One can, as early as at the siting stage in the planning process, simplify orientation for people with impaired vision. Important and frequently used functions will be easier to find if they are placed centrally to, or in the near vicinity of the areas (rooms, units) which they are intended to serve. To avoid possible confusion one can also separate different functions (for example goods-entrance and staff-entrance).

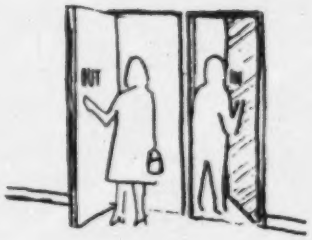


Planning and design

A good planning solution should be simple. It should be easily understood also by people with impaired vision. Orientation is easier if the plan, pavements, roads and paths keep to a right-angled system. It is important that intermediate objectives such as lifts, stairs and reception desks should be particularly easy to find.

Orientation across open areas is difficult. It is therefore advisable that large areas should be broken down into smaller areas. Areas

which are too small, such as narrow corridors and passages, can of course make orientation more difficult since it is easy to collide with other people or objects.



There should be no obstacles on pedestrian circulation routes. Information desks, signs etc should not be placed in positions where they become obstacles themselves, or where the people gathered round them will be in the way. Columns and chairs should e.g. be avoided within circulation areas.

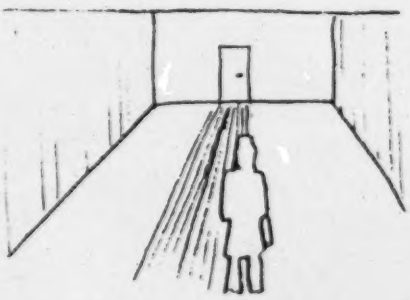
Plan for the division of pedestrian traffic. In order to avoid collisions at entrances they should be clearly divided into "in" and "out" traffic.

Attention should be paid to details which do not appear from the plan. A stair should not be designed in such a way that it is possible to pass under its lower reaches.

Free head room above a pedestrian area should never be less than 220 cm.

Furnishing, fitments, materials

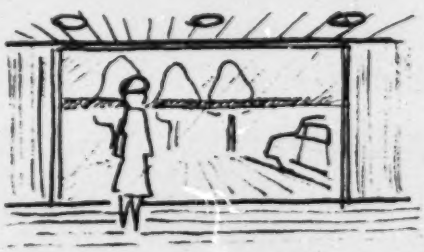
To make orientation easier large areas should be broken down into smaller, preferably rectangular areas. This can be done by the placing of furniture, making sure at the same time, however, that the furniture will not obstruct passage. Large areas can also be broken down by marking the circulation routes in a different colour from the rest of the flooring, or by using materials which give different sound impressions. The softness (spring) of the floor can for example give directional guidance. Note that wall-to-wall carpeting eliminates nearly all echo (see Sound, page 13). Circulation routes can for example be carried out in patterns which clearly separate them from the surrounding floor surfaces. The texture of the walls can also consciously be made to vary.



Not only staircases but also other areas (e.g. corridors) should be equipped with handrails to give directional guidance.

The general rule that free head room should never be less than 220 cm applies also here. Signs, awnings, light-fittings etc must therefore be above this height.

The location of completely glazed areas – glass doors and large windows – should be carefully considered. In order to prevent people from walking into glazed areas one should mark them with a coloured band which can clearly be seen against the background. The band should be placed between 140–160 cm above floor or ground level.



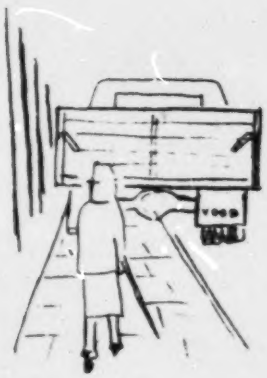
The choice of furnishing materials and colour should be made with a knowledge of their characteristics regarding the reflection factor and mirroring effects. A high mirroring factor in a material often gives negative effects. As an example, a floor can give irritating reflections from lights in the ceiling and cause dazzling

which in turn may impair the vision. A high reflection factor and the use of light colours influence the mean luminance and give light interiors. One should choose a source of light so that colours are reproduced naturally. Materials and colours must be chosen in light from the source of light which will be used (See Light, page 30).

The acoustic conditions should be good. One must choose a suitable reverberation time. Sounds should not be too little dampened, as is often the case in public swimming-baths and entrance halls. They should on the other hand, not be dampened too much as in many conference rooms.

Various controls, taps and light switches should be recognizable to touch and to people with poor eyesight. By using taps which are standardized in design and colour, and which are placed in a standard fashion, it will be easier both to find and use them.

Doors and gates should be hung so that they open from a busy area into a less busy one (See Doors, page 33).



Obstacles

Under this heading a number of things are dealt with which can not normally be classed as problems, but which can, for people with impaired vision, cause unpleasantness, or even injury.

An obstacle can be

immobile, such as bicycle stands, flower-boxes, pillars, posts, signs, awnings, balconies and vegetation;

mobile, such as doors and windows;

temporary, such as vehicles, wiring-off of for example roadworks, scaffolding, heaps of snow, sand and building materials.

Obstacles should be placed at the side of pedestrian ways and areas, and they should be so designed that parts of them do not stick out.

Free head room above pedestrian ways and areas should at no point be under 220 cm above floor or ground level.

One should warn or protect against unavoidable obstacles by using varying floor or surfacing materials, or by safety arrangements such as fences or rails.

Design obstacles (e.g. time-table signs) so that they will not cause injury to anyone who bumps into them.

Any temporary arrangement to close off pavements etc should be placed at a safe distance from the obstacle. The actual arrangement should consist of two horizontal wooden spars, of which the upper one should be approx. 90 cm above the ground. They should be in position both during and after working hours.

Snow is a particular problem. It can cause slipping and stumbling and it makes it difficult to recognize normal "guiding features" such as kerbs. Snow also dampens sound. (See also Signs and sign-posting, page 32 and Doors, page 33).

Information

Information can be given in many ways. Verbal information can be imparted directly – at an information desk – or inderectly – over a loudspeaker. One can receive information from signs, and from sound and light signals. Contrasting colours and materials on different surfaces, handrails, and other arrangements can also give information.

Verbal information is often the best alternative for people with impaired vision and should therefore be used as widely as possible, for example over loudspeakers in trains, underground trains, and in buses. In this way one can lessen the dependence on visual information.

At an information desk the distance between the mouth of the speaker and the ear of the listener should not be too great. Note that glass screens generally make communication more difficult. People with impaired vision may not even observe the glass.

Signs should be so placed and designed as to allow one to get close up to them and read by touch or by people with impaired vision. (See Signs and sign-posting, page 33).

Sound signals (acoustic indication) can also give information. In lifts, at pedestrian crossings etc, ordinary forms of information should be complemented by sound signals. Sound beacons (see page 21) should be used to indicate direction. The "engaged" – "wait" – "come in" sign should have an acoustic signal at "come-in".

Relief maps of buildings and areas should be placed at central points, and should also be available on a more reduced scale to hand out to people.

The call-buttons for door-telephones should have at least the numbers in relief.

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Daylight can be very strong, but also varies according to the time of day and the season of the year. Daylight therefore, must be complemented by artificial light. Daylight intakes can also cause undesirable mirroring effects. If one uses daylight, the lighting in adjoining areas must also be strong, otherwise the difference in lightness may be so great that one gets dazzled.

General lighting and directed lighting should complement each other in such a way as to create a good contrast relationship.

The difference in lightness between two surfaces should not be so great as to tire and irritate the eyes.

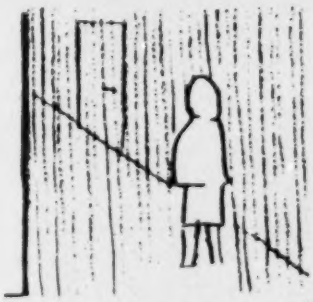
It is important that light-fittings are correctly placed so as to avoid dazzling effects, direct or by reflection within the field of vision. One should choose well-shielded fittings.

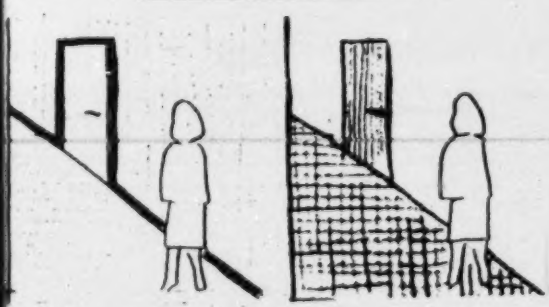
Make sure that the relationship between light and colour is such that the lighting does not take away the desired colour contrasts. (See further Light, page 30).

Light

In many situations one requires better and stronger light than is normal today. People with impaired vision, and with some remnants of vision are dependent upon a better quality of light. This applies also to many elderly people.

The lighting environment is influenced at an early stage in the planning, among other things by the choice between daylight and artificial lighting. It is therefore important that as early as the sketch-planning stage one gives consideration to the placing and design of points of intake and sources of light.





Colour

For people with poor eyesight and people with varying remnants of vision, colour is not only important from an emotional or aesthetic point of view, but above all is important in order to make orientation easier. Properly chosen and placed colours make it easier to move around over large areas, to orientate "at close range" – to feel for objects – and to understand signs and other information.

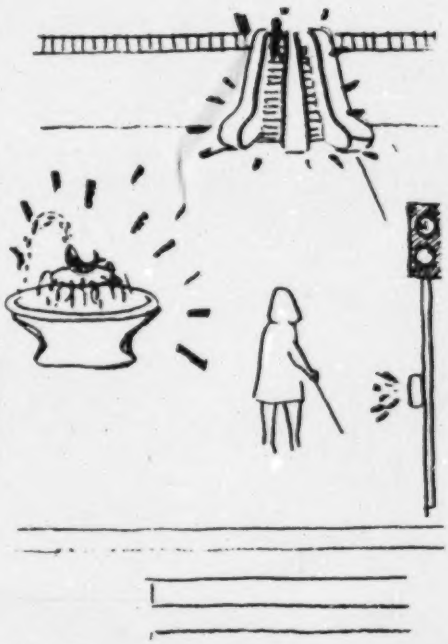
The eye is sensitive to colour experiences only if the strength of light is sufficient. The experience of colour increases with lightness. Experience of colour is at its maximum with orange, yellow and light green colours, and decreases towards the red and violet.

Make use of contrasting effects in colour-schemes. In order to make orientation safer one should separate different surfaces by using contrasting colours.

Choose colours and interior materials with a knowledge of their reflectioning and mirroring factors.

High reflection factors and a light colour-scheme influence the mean luminance (lightness) and create light interiors. Low reflection and dark colour-schemes have the reverse effect (See Light, page 30).

Lighting and colour-schemes cannot in fact be treated separately. Choose colours and materials in light from the source of light which one intends to use. The lighting should bring out the colours "naturally".



Sound

Sound can have both positive and negative effects for people with impaired vision.

As an echo from a footstep or a stick, sound has a positive effect and acts as a complement to other signals (acoustic signals). Certain continuous sounds, such as the sounds from an escalator or a fountain can also make orientation easier.

Sound has a negative effect when, as noise, it distorts or blocks desirable sound. "Noise is mist to the blind". Wind has both a dampening and a distorting effect. Sources of noise should be screened so that they do not disturb sounds which give directional guidance. If one can dampen the sound of an underground train in a station then it becomes easier for a person with bad eyesight to orientate himself by the sound of an escalator, or by using stick-technique.

Unsuitable acoustics – too much or too little dampening – can make communication between people more difficult or even impossible, particularly for those who can only rely on their sense of hearing.

Materials of pedestrian circulation routes can give a certain amount of information since different materials have different sound characteristics when one walks on them, and particularly so when one uses a stick. Certain floor-surfaces, such as wall-to-wall carpeting, remove nearly all "echo", thus making orientation more difficult.

In the case of lifts and pedestrian crossings, optical signals should be complemented by acoustic signals.

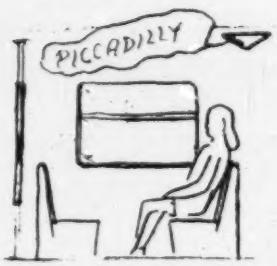
Special attention should be paid to the quality of sound at information desks and in loudspeaker systems etc. Place the loudspeaker in such a way as to give a correct "sound-picture". That is to say so that the sound will appear to come from the direction of the person speaking.

General

Certain factors within the field treated by this publication cannot be directly influenced by physical planning and design, but are at the same time very important.

One should inform people in various positions of responsibility and authority how they can, in their daily work, make orientation easier for people with impaired vision by, for example

- remembering that quiet vehicles (e.g. trolley-buses) can be difficult to detect for those who have to rely only on their hearing
- driving carefully, and signalling when crossing a pedestrian way
- making sure that verbal information is clearly understandable, particularly when it is given over a loudspeaker on buses, trains, and underground trains.



Also inform people with impaired vision regarding the temporary closing-off of certain areas and diversions in pedestrian ways, communications etc.

When providing housing for people with impaired vision one should bear in mind that someone who will be spending a large part of his leasure time in his house or flat, needs large areas and a balcony. There should also be common areas for recreation and exercise in the building.

ENVIRONMENTS

Primary buildings

Orientation is usually easier in environments where one lives or spends a lot of time since they are familiar. In this study such environments have been termed primary buildings. The term is mainly intended to cover living areas and stairs and entrances to dwellings, but it also includes other environments such as entrances to places of work. The problems in environments in which one moves daily tend to diminish after a time as one adapts oneself to one's surroundings. At the same time there is still a lot which can be done to make daily work, and daily living, easier.

The living area

A living area can be in a block of flats, a villa, a student hostel etc. Here the problem of orientation is a lesser one, but at the same time the form and design of the living area are important. It is important that the furnishings and the technical and mechanical fitments do not cause problems.

The various parts of the living area should not be too cramped. Passages, corridors etc should not be so narrow that one runs the risk of banging into the walls or colliding with someone coming from the opposite direction. Doors and cupboard doors should be so placed and designed so that one does not run the risk of bumping into them. The use of sliding doors instead of hung doors diminishes the risk of a collision with an open door.

Light switches and controls should be uniform, above all as regards markings so as to enable blind persons as well as those with impaired vision, to use them.

Light switches should be of the flat plate type and should all have the same positions for "off" and "on".

Coat-racks, shelves etc, should not protrude in such a way as to cause injuries.

Daylight is desirable. Artificial lighting must be sufficiently strong, but without dazzling effects or reflections, particularly as regards working surfaces.

The impressions gained by hearing are very important, and therefore one must demand good sound insulation.

Entrances, staircases

Entrances, staircases, and other intermediate objectives should be situated centrally, and in such a way that they are easy to find. In order that they may be seen from a distance they can be painted in contrasting colours.

The plan, and the way of furnishing should be such that they create a right-angled pattern. No changes of level nor obstacles

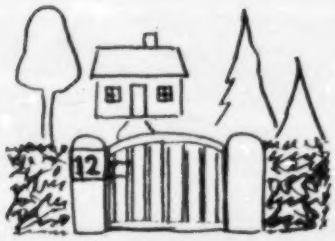
should occur along the circulation routes. Handrails, and the use of different materials and colours can give directional guidance.

There should be storage room for mobile objects (e.g. prams).

Outside doors should be set back from the line of the facade of the building. Swing-doors, and in particular automatic ones are difficult for people with impaired vision.

Staircases should not be placed in positions where one can unintentionally step out onto them and fall down. (See Staircases page 27-28).

Information - desks and signs etc must be placed where they can be easily found and made use of (See Information, page 11 and Signs and sign-posting, page 32).



Street numbers should be able to be clearly seen, preferably before one reaches the building in question. In housing areas consisting of detached or semi-detached houses with gardens, the house number should be at the gate. The number is best in relief since it can be "read-off" by touch. In multi-storey buildings the floor number should also be in relief.

Certain sources of daylightning, such as floor-to-ceiling windows can cause lighting and orientation problems. This is because the various directional movements on for example a staircase, are relatively complicated, the movement being both horizontal and vertical, turning corners etc. It is important to suit the light to the direction of movement. Make sure also that the difference between the daylight outdoors, and the artificial lighting indoors is not so great as to cause one to be dazzled when stepping out from a dark entrance into the daylight.

The environment between buildings

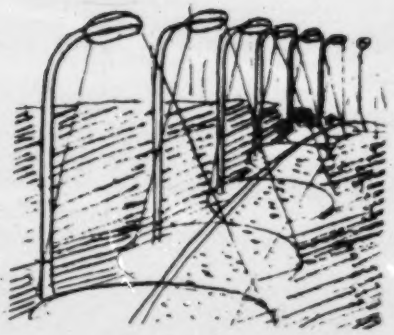
This part deals with both simple and complex areas. The simple type of areas are areas such as pedestrian ways, cycle paths and pavements. The more complex areas include courtyards, children's playgrounds, vehicular access points, parkingplaces, streets and squares, and also covered malls and large entrance halls.

Pedestrian ways

The problem regarding pedestrian ways is not so great. They should in a simple manner lead to objectives such as entrances. They should preferably follow a right-angled system and their surfacing, or at least their edges should vary in colour or material from the surrounding surfaces. Edges such as kerbs, should give directional guidance particularly to people using a stick. Handrails and rails can also be used. They can give directional guidance, they can warn, and also protect.

Odd, unexpected differences in level should be avoided. Obstacles such as bicycle tracks, kiosks, vehicles, and parking should be placed off the pedestrian ways. Width and head room (220 cm) should always be sufficient. Signs and sign-posting should be

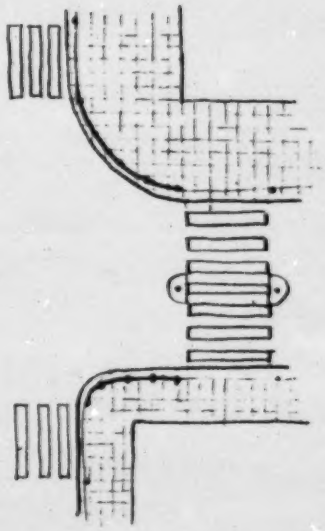
carried out in such a way that someone with impaired vision can find, get up to, and read the sign in question. Lighting, in combination with the use of colours and materials, should improve the possibilities for orientation. The fact that different materials give a different sound impression (echo) is an advantage.



Where a pedestrian way crosses a trafficated road or street one should in some way mark this, and at the same time define the direction of continued movement. This can be done using contrasting materials, colour or extra lighting.

The marks of recognition of a pedestrian way must continue also where a vehicular route crosses the pedestrian way. This can occur for example at the entrance to a parking lot or a garage.

The lamp-posts should be placed at one side of the pedestrian way. Pedestrian ways should preferably be separated from cycle roads. Parking meters and posts etc should be placed at the edge of the pavement, either up against the buildings or, provided the pavement is wide enough, on a special band at the outer edge of the pavement. This band should be carried out in such a manner that it contrasts with the rest of the pavement.



Pedestrian crossings

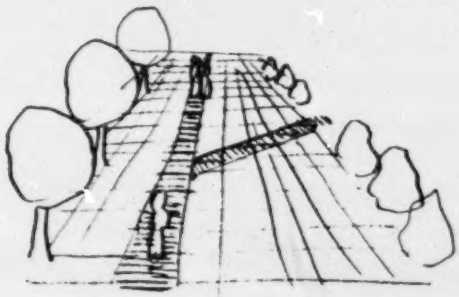
Pedestrian crossings should be situated at points where the kerb is at right angles to the direction of movement and preferably where the crossing distance is shortest. The kerb can give directional guidance. Orientation is made easier if the zebra markings are slightly raised. There should be extra lighting at a pedestrian crossing. Both sides of the crossing should be marked by a sign. The posts holding the signs should in some way be distinguishable from other posts. When the "go" signal is on for pedestrians then naturally all vehicular traffic must come to a halt. It is important that one can easily find out whether the crossing signals are manually or automatically operated. There should always be an island or refuge in the centre of the crossing, and its shape, colour and material should make it clearly distinguishable.

Open areas

The problem of orientation is greater in the case of open areas. It is an advantage if these areas can be broken up into smaller areas by means of "furnishing" in right-angled patterns. Any obstacles should be clearly marked (colour, material) and surrounded by a rail, or preferably constructed so as not to constitute any danger. Certain traffic categories will have to be kept out by fences, rails, etc, which should be so designed that they do not cause injuries.

Playgrounds shold be enclosed. They should be formed in such a way that one cannot unintentionally blunder in among the various sand-pits, chutes etc. Parents with impaired vision should be able to look after their children in playgrounds. Swings, roundabouts, and other moving apparatus are particulary dangerous.

Vehicular access points should be placed close to entrances while *parking* should be located further away. Parking lots should prefe-



rably be located in such a way that one does not normally have to cross them.

Squares and *open spaces* should be planned as described above. Make as much use as possible of colours and materials to give directional guidance, particularly in covered malls and indoor squares. The furnishing is often complicated, e.g. wastepaper baskets, display units etc. These should be placed at fixed points, and they should be designed so as not to cause injury.

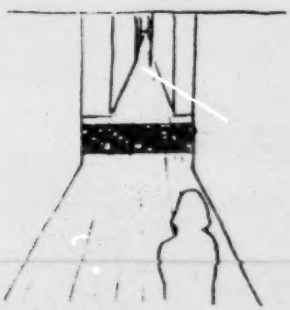
Secondary buildings

This section deals with buildings and groups of buildings where orientation is often rather difficult. One reason for this difficulty is that the buildings are large and complex. This can apply to recreational buildings, schools, shops, hospitals, hotels etc. Difficulties regarding orientation depend, to some extent, upon how often one visits a building.

The buildings should be centrally placed. Primary objectives such as entrances, reception desks and lifts should be easily found. Planning solutions should be clear, easily understood and should preferably follow a right-angled pattern. Circulation systems should be easy to understand and follow.

It is important that rooms such as cloakrooms and toilets should be adjacent to, and easily accessible from, the areas which they serve. In designing furniture and fitments sharp edges and corners should be avoided. Obstacles should be kept out of circulation areas. Special attention should be given to doors. Correct information and signs and sign-posting are essential conditions for accessability.

Relief plans should be put up by the entrance to a building or block of buildings. Smaller portable maps or plans could also be available. The question of lighting is important, particularly in circulation areas. The demands regarding both general and local lightning must be met. The way daylight falls should neither cause reflections nor dazzling. Make use of colour contrasts as far as possible. Since impressions gained from sounds are important, the general acoustic relationship must be carefully balanced.

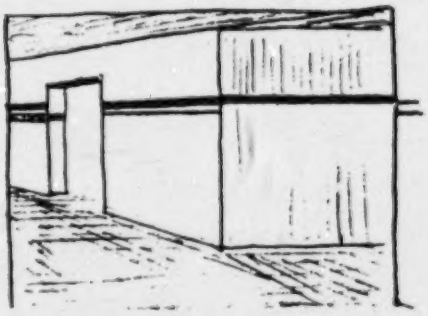


Corridors

The flooring in corridors should differ from the general flooring in a building. This is to make the corridor easier to find, and also to make it easier to find one's way. Handrails can also be used in corridors. Corridors should not end by a large window or other sources of daylight.

Well-planned lighting and colour-schemes make movement from place to place easier. The lighting can show the direction of movement. Stronger light in combination with contrasting colours should be used at critical points. Mark the doors or doorposts in contrasting colours.

Orientation can be made easier if, in addition to normal signs and sign-posting, coloured bands are applied to the walls of the corridor at a height of 140–160 cm above the floor.



Recreational buildings, schools etc.

In *recreational buildings* such as gymnasiums, public swimming baths etc there are big problems regarding light and sound. Large sources of daylight give irritating reflexions, particularly from the surface of water. Sound absorbent materials must be used, particularly where there is a lot of hard material such as tiling, which causes echo.

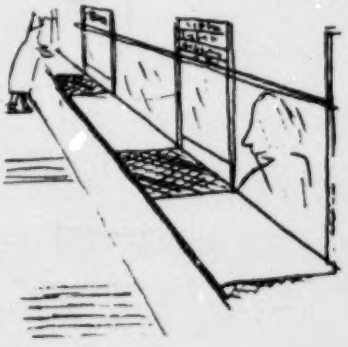
Because of the lively and more uncontrolled movements of children, special care must be taken in *schools* and similar buildings with regard to the design of coat-racks, hooks, rails, and corners.

Rooms where *teaching* or *writing* takes place must have good lighting.

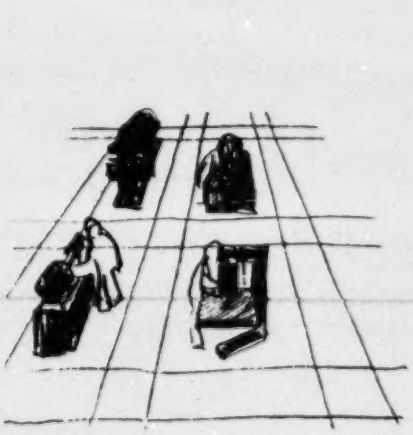
The direction and spread of lighting should eliminate the risk of dazzling, direct or by reflection. One should have high demands regarding contrasts on reading and work surfaces. This means that the contrast between the text and the paper for example should be at least 90 %. There should be extra plugs for individual lighting. Pay special attention to the acoustics.

Shops, banks, post-offices, and similar buildings

People with severely impaired vision often prefer *shops* where they are served to self-service shops. The display-fitments and dimensions must be such that goods etc do not have to be placed in the passageways. Place the goods logically and uniformly. Adapt signs and price-markings to suit people with impaired vision. The colour temperature of the lighting is important when it comes to being able to distinguish between different types of packages.



In *banks, post-offices* and similar buildings contact takes place mainly accross a counter. The floor as well as the surface of the counter should be of contrasting colour and material in front of each window. Place desks and other furniture so as to avoid problems. Information, signs and sign-posting must give sufficient directions. It is desirable to improve the lighting, particularly on writing-desks, which should be independently lit.



Workshops

In storage-areas, workshops etc, the areas which one should have access to, and those which one should not have access to, or are even dangerous, should be clearly separated. In places of work which are particularly dangerous, there should be acoustic signals and reflecting signal colours, in certain cases in combination with lights. (See Areas for certain types of work, page 26).

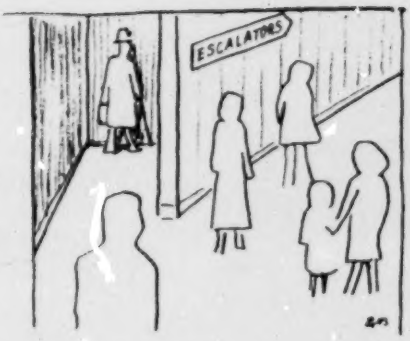
Public transport

Many people with impaired, or even severely impaired vision, use public transport. In order that these people should be able to function as well as possible in society it is important that the various forms of communication are correctly designed. This section deals both with buildings and vehicles in connection with "track-bound" and "non track-bound" forms of transport. For example, bus-stops, terminals, stations, airports, buses, local- and long-distance trains and aeroplanes.

In planning for public transport it is important that things are done consistently. All the units in a sequence should be carried out according to the same principles. This applies for example to underground stations.

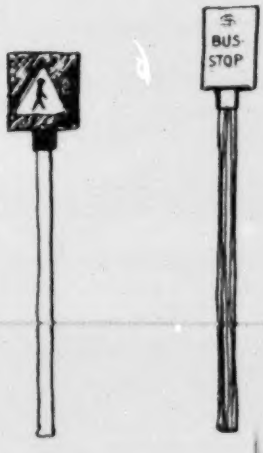
Stations

Planning solutions for stations, terminal buildings etc, should be easily understandable and without dead-ends. Since there may be frequent changes in direction, both horizontally and vertically, the points where the changes in direction occur must be specially marked in some way. This can be done by using contrasting colours and materials, and in certain cases stronger lighting.
the edges of platforms with contrasting colours and materials. The level of the platform should be at the same height as the floor of the carriage, bus etc. The platform should slope away from the track. One should be able to orientate oneself along the part of the platform which is furthest away from the track – along the centre-line of the central platform.



All furnishing should be at the side of pedestrian routes, and have no sharp edges. Benches etc should be placed in niches. Use handrails as far as possible to give directional guidance.

The placing, hanging and design of doors and gates should cause as little conflict as possible. Verbal information, and information from signs and sign-posting must complement each other (See Signs and sign-posting, page 32). A good level of lighting without dazzling or reflections is a must. The placing and direction of the lighting in combination with a well-planned colour-scheme can simplify orientation. One can for example heighten the contrast between the floor and the walls. One should try to dampen the noise from particularly noisy vehicles in order that other sounds can also be distinguished.



Bus-stops

Bus-stops should not be so situated that they are cut off by other traffic. The bus-stop signs should be placed at the inner part of the stop – for example against a building. The posts and signs should differ from other posts and signs. They should be recognizable by touch and to those with weak eyesight. The actual stopping position can be marked by a railing, by colour, or by a slight raise in level. There should be protection from the weather where the buses stop. Changes should take place at a refuge and all vehicles should stop at the same place.

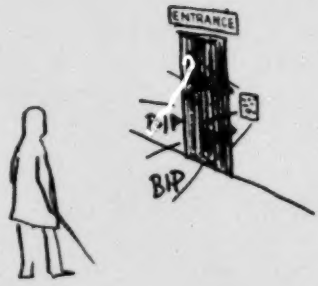
Vehicles

For vehicles such as buses, and for trains, it is important that there is not too much difference in height between the level of the platform or stop and the floor-level of the bus or carriage. To make getting into and off trains etc easier they should preferably be at the same level. The doors should operate in such a way that one does not run the risk of being caught in them. There should be no differences in level in the gangway of a bus. A slight slope along the gangway might just be accepted. Seats, poles, racks and other furnishings should be placed, coloured and designed in such a way (e.g. racks with soft edges) as to make orientation easier, and not cause injury in the event of a collision.

Other environments

Parks, recreation areas, the countryside

The earlier sections of this publication have dealt with environments with a relatively fixed structure. The areas which are described in this section are important, but the possibilities to influence orientation are small. This applies to areas such as parks, recreation grounds and the countryside in general. Generally these areas have been formed according to very "loose" plans or no plans at all. Other areas such as smaller communities, and parts of towns, can have similar basic structure and problems.



With the exception of parks, areas of this type often lack paths, or else the paths form part of the roads. Lighting is also usually lacking. The possibility of personal help and contact can, on the other hand, often be good.

At present we have little knowledge as to what can be done. Pedestrian ways and bus-stops should as far as possible be marked according to what has been said in previous sections of this publication. Rails and contrasting colours and materials should be used. Cleansing and snowclearing should be thorough. Signs and signposts can, if properly designed from a visual and tactile point of view, be of help – also to people with impaired vision. Relief-maps can be used.

In certain circumstances guide wire devices or sound beacons can be used to give directional guidance.

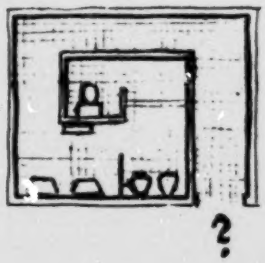
A *sound beacon* is an orientation aid device which gives out continuous or intermittent sound-signals. The beacon can be fixed in position or portable. A *guide wire device* is a current-carrying wire which is buried in the ground. Its surrounding magnetic field is influenced by a special stick which gives signals to the bearer.

SPECIAL ENVIRONMENTS

Areas for hygiene

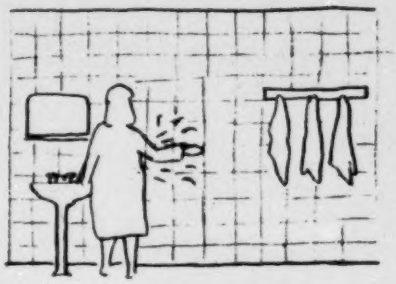
Toilets, showers, baths, saunas etc

The problems and solutions regarding areas for hygiene as described here apply mainly to larger units in public buildings. Toilets, showers, bathrooms and other rooms with functions related to hygiene often have complicated furniture and fittings. Walls, floors, and fitment details are frequently made of shiny or reflecting materials. The movements involved in washing, going to a toilet etc are rather complicated. Thus the risk of injury is great even if one has prior knowledge of the room.



Siting Planning Design

Units and areas for hygiene should be properly placed near the areas which they are intended to serve. For example, a toilet in a hospital should be immediately adjacent to a waiting-room or waiting-area. This implies, among other things, few changes of direction. In order to avoid risks there should be no differences in level. It should be planned so as to make orientation easier.



Furnishings Fitments Materials

Place furniture and fitments in such a way as to create clear circulation routes. In order to achieve this in smaller areas it is preferable to place furniture and fitments along the walls. Sharp edges and corners must be avoided. One should not have to run the risk of bumping into projecting parts. Instead these should be built-in. As far as possible one should aim at a standardized design and location of light switches, taps, tioletpaper holders etc – at any rate in the same building or group of buildings. Fitments should be within easy reach. In public lavatories there should be a wash-hand basin in every unit.

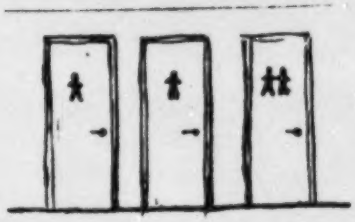
Do not choose shiny tiling or similar materials which have a high mirroring effect and cause irritating reflections. Floor materials should be non-slip. Contrasting floor materials can be used to give directional guidance.

Obstacles

Place taps in such a way that one does not bang one's head on them when bending down to wash. Doors, which in areas of this type often open outwards, should be fitted with door-closers.

Note that even if partitions, controls and taps are unsuitably placed, they must be so designed as to avoid causing injury.

Information Signs Sign-posting
On toilet doors should be placed a simple symbol, carried out in relief and in a contrasting colour to the door. It should be placed at a height of 140–160 cm above the floor. It is an advantage if the information regarding "engaged", or "vacant" can be presented in such a way that it can be understood by people with impaired vision.



Light
Daylight varies greatly and should therefore be complemented by artificial light. Choose fluorescent lighting for hygiene areas. The fittings should be placed in the ceiling and beside mirrors, but not in such a way that they will cause dazzling. It is important that the lighting strengthens colour contrasts, thus making orientation easier.

Colour
In order to make orientation easier it is desirable that the floors, walls, and sanitary fitments are in contrasting colours. Other fitments, such as toilet-paper holders, should also be in a colour which differs from its surroundings. This makes them easier to find.

Sound
Bear in mind that the type of materials often used in wash-rooms and swimming-baths frequently causes troublesome echo effects.

This can be avoided by the use of sound absorbent materials, in the ceilings for example.

Areas for changing

Hallways, cloakrooms, changing rooms etc
The problems in halls, cloakrooms and changing rooms for people with impaired vision are not great provided that the room is familiar. It is easy to find one's way in one's own hall, but it can be difficult to find the cloakroom in a public building. It can also be difficult to orientate oneself in a changing-room with which one is not familiar.

Siting Planning Design
Changing areas should be easy to find, and it should be easy to find one's way back to them. They should naturally be immediately adjacent to the rooms which they are planned to serve.

Halls, cloakrooms and changing rooms should not be too small. To make orientation easier, there should be clearly defined circulation areas in these rooms. Various items which could be in the way – shelves, umbrella stands etc – should be placed in niches.

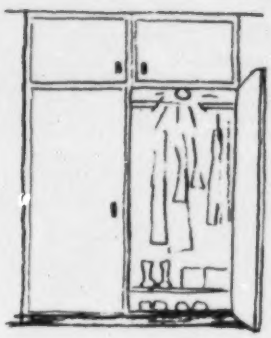
Furnishing Fitments Materials
Place fitments along the walls. They should preferably be built-in but can also be constructed in other ways so as to eliminate the risk of collisions and injury. Wall hooks, for example, can be protected.

Wardrobes, cupboards and other storage units should be roomy in order to make it easier to find things.

Obstacles
Note that it can often be difficult to distinguish shiny metal pipes which cause reflections. Loose coat-hangers, umbrella stands, ash-trays on feet etc are obstacles and should therefore be avoided.

Information Signs Sign-posting
Proper signs, which can also be read by people with impaired vision, should indicate the way. The numbers on changing rooms and cupboards should be carried out in relief.

Light
The general lighting should be good, and it can be complemented by wall-fitments mounted beside mirrors. Cupboards and lockers should have built-in lighting which is switched on automatically when the doors are opened.



Colour
Shelves, benches and other furniture should be painted in colours which contrast well with walls and ceilings.

Areas for housework

Kitchenettes, kitchens, rooms for household washing
Kitchenettes, kitchens and rooms for household washing, particularly in unfamiliar environments, can create problems for people with impaired vision. What one should try and avoid is unexpected problems such as when a cupboard door is left open so that one risks bumping into it.

Planning Design
Large floor areas and large working surfaces make working easier. Orientation is made easier if circulation areas are kept clear. There should be daylight.

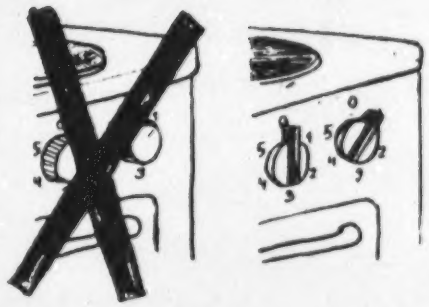
Furnishing Fitments Materials
Storage areas should be generously dimensioned. Everything can then have a place reserved for it, thus making it easier to find.

Doors to top cupboards should be of the sliding type, either horizontally or vertically. This eliminates the risk of banging one's head against the doors when they are open. To simplify cleaning, surfaces should be hard-wearing and easy to keep clean. They should also have a low mirroring and reflecting factor.

Note that certain parts of kitchen fitments, such as hot oven-handles can cause problems.

Stoves

Stoves should be designed and placed in such a way that there is a free working surface on both sides of them. One should be able to know where to find the hot-plates without burning oneself. Control-knobs should be on the front of the stoves. It should be simple to relate which function the various controls regulate. The various settings of the controlknobs should be able to be clearly felt. The various positions of the control-settings should be clearly marked in relief (for example a temperature line on the oven thermostat).



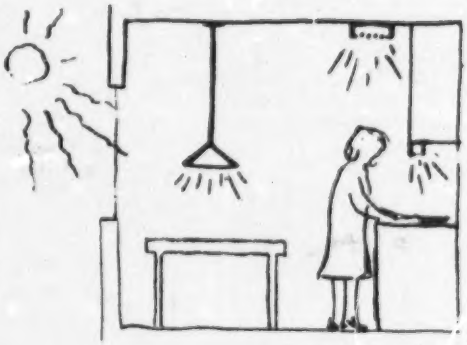
The stove should of course be so designed that one does not burn oneself on it (hot oven handles etc). The oven light should not be placed at the back of the oven since, in this position, it can cause dazzling. The stove should have an acoustic signal which goes on when a special button is pressed. In this way one will know when the stove is on. One can also use the same arrangement to indicate whether or not the oven has reached its correct temperature.

Information Signs Markings

The controlknobs of washing machines and other household appliances should be designed in such a way that they can be used by people with impaired vision. Symbols, letters and signs in relief should be used in markings and instructions to make them more easily "read-off".

Light

Lighting is particularly important in areas where household work is being done. Fluorescent lighting should be used both for roof-lighting and for strip-lighting under cupboards etc. It is important to choose fluorescent lighting with good colour qualities.



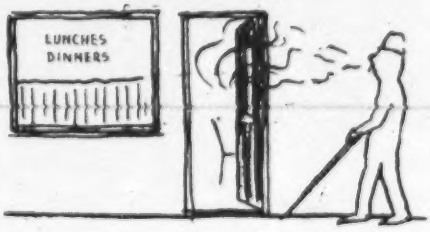
Fittings with light-bulbs should be used for lighting tables at which meals are served. Light fittings should be placed in such a way that they do not create shadows on work-surfaces, and also reduce the risk of reflective dazzling from sinks and metal work-tops etc.

Sound

As in the case of stoves, acoustic signals can be used to indicate when various household appliances are in function.

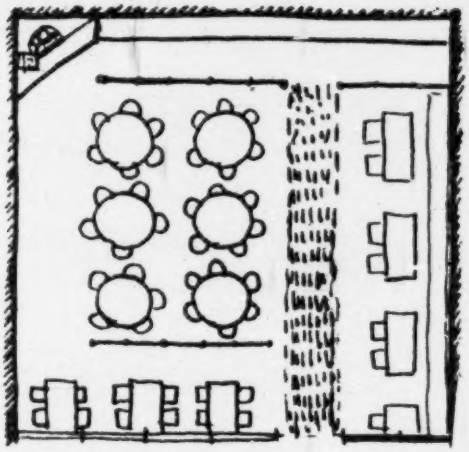
Areas for meals

Lunchrooms, self-service, restaurants



Siting Planning Design

The normal rules for siting and planning apply here: central placing, easy to find toilets, cloakrooms etc, clear circulation areas. The staff should be able to see the whole area, and in particular the entrance.



Furnishing Fitments Materials

Using the furniture layout to break down large areas into smaller areas will make orientation easier. It is preferable to use a right-angled system. Varying floor materials, rails to give directional guidance, and contrasting colours and materials can be so used in self-service restaurants that one can at least find one's way from the entrance to the order desk.

Obstacles

There are many obstacles in this type of environment. Tables, chairs, screens flower-arrangements etc should be placed in such a way that they do not obstruct orientation, but rather give directional guidance to someone with impaired vision.

Information Signs Sign-posting

If there is a "wall-menu" in the room, its text must be at least 15 mm high to enable people with poor eyesight to read it. If the restaurant is frequented by many blind people then the text should be in relief. One should be able to get close up to it.

Light

The lighting must be good and well shielded. Avoid direct – or reflection dazzling. "Intimate" restaurant lighting is unsuitable.

Use directed lighting to bring out details or circulation areas in the room.

Areas for certain types of work

Office-work, workshop and storage work etc.

Studying, office, and workshop type of work is often carried out in familiar environments. Therefore in these areas there should be no problems involved for people with impaired vision.

Siting Planning Design

A work-place, which is to be used by a person with impaired vision, should be close to communication areas and also close to the toilets, cloakroom and lunchroom. It should be so located as to minimize the noise from traffic and machines. Also in this type of area, right–angled solutions are preferable. In workshops etc, differentiate between circulation areas for people, and circulation areas for the movement of goods.

Furnishing Fitments Materials

Machines etc should be placed according to a logical, preferably right-angled, system. There should be free circulation routes so that one does not collide with furnishings and machines nor unintentionally come within the working area of the machines. Should it prove impossible to arrange obstacle-free circulation routes, one must give warning of obstacles either by differing floor ma-

terials or by safety-rails. Use contrasting lighting, colours and materials. Loading-bays should be so planned that one cannot unintentionally walk out onto them. This can be achieved by the placing of the loading-bay, by closing off the loading-bay, or by a gate or boom on the loading-bay itself.

Information Signs Sign-posting
It is particularly valuable if one can find one's own way to various officials, foremen etc. Name-plates and room numbers should be carried out in relief.

It is also important that proper information is given as to the location of the various areas. One should also describe how the machines and their controls function, in order to enable people with impaired vision to use them.

Light
Both the general lighting and the lighting above the work place should be of high quality. The lighting should neither dazzle directly nor indirectly. There should be an equal spread of light over the entire working surface.

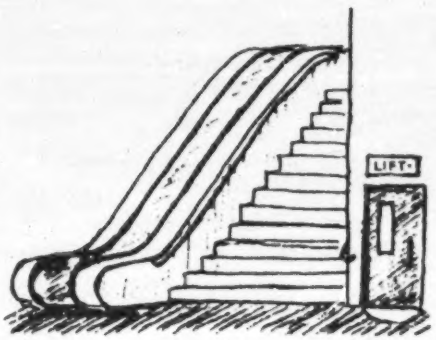
Colour
Mark parts of the building, floor and walls, in contrasting colours. Machines and machine parts should also be made distinguishable from surrounding surfaces. This can also be done by using contrasting colours.

Sound
It is important that disturbing sounds are eliminated. People with impaired vision use their sense of hearing more and thus require greater concentration when they are working. Adapt the acoustics to suit the type of work which is being done, so that both speech and any occurring signals can be clearly heard.

Areas for vertical communications

Ramps, staircases, lifts etc
This section deals with all forms of vertical communications.

It is difficult for a person with impaired vision to know where a staircase begins and ends. It is also difficult to find the right button in a lift, and to know at a distance which escalator is going up, and which is going down.



Siting Planning Design
Ramps, staircases, lifts etc should naturally be placed where they are easy to find.

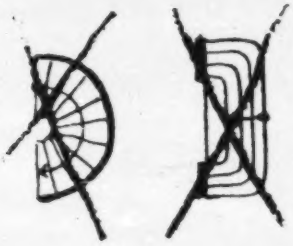
Staircases should be so placed as to avoid the risk of someone's falling down. Nor should they be placed in an unexpected position. Put them at the side of, or perpendicular to, passages, corridors and other circulation routes. Staircases and ramps should have the same design at different floor-levels within a building. There should be no odd steps, but in case there are such steps, they should be designed in conformity with the staircases.

Obstacles

Sometimes staircases are built in such a way that it is possible to pass under their lower reaches. A person with impaired, or severely impaired, vision can easily bang his head on a staircase of this type. For this reason the lower part of the staircase should be built-in, at least in such a way that the headroom is not less than 220 cm. In certain circumstances the staircase can be surrounded by a safety-rail.

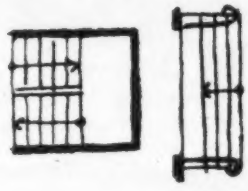
Information Signs Sign-posting

It is important to inform where lifts, ramps, staircases etc are located within a building. This can be done by signs, sign-posting, and varying floor materials etc.



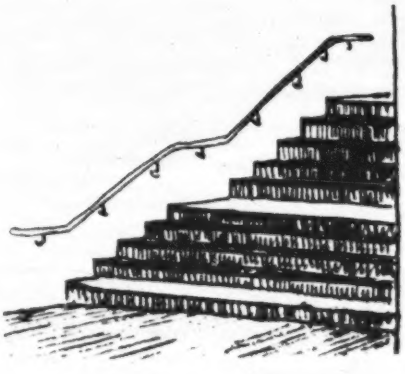
Light

Lighting is important. It should be especially strong at critical points, particularly at the beginning and end of a staircase. The lighting should work in combination with the colour contrasts.



Colour

Use contrasting colours to mark the first and last step in each flight of stairs. Mark the corresponding parts of ramps.

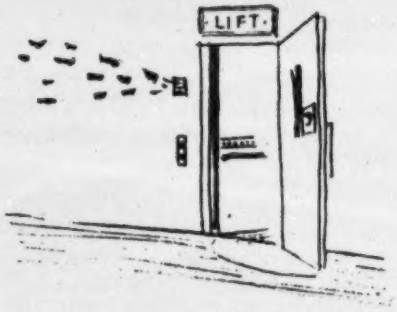


Staircases

Flights of stairs should be straight. Each part of a staircase should have equal number of steps. The size of the steps, both in height and depth, should not vary. Avoid open steps or nosings where people's feet can get caught. At the upper end of the staircase there should always be a flat area. Surfaces should be non-slip. The first and last steps should be carried out in a colour and material which contrasts with the rest of the staircase. Handrails or rails should follow the flight of stairs without a break, and preferably on both sides of the staircase. The handrails or rails should extend at least 30 cm beyond both ends of the flight of stairs, and they should finish up in such a way so that one does not get one's clothes caught.

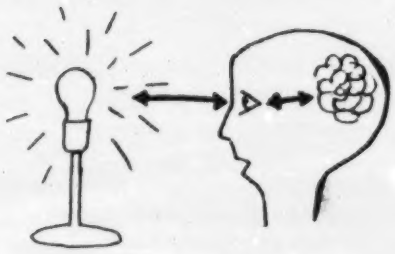
Lifts

All floors should be served by lifts. Through-lifts, with the doors facing in different directions on different floors, make orientation more difficult. A limited area in front of the lift door should be painted in a contrasting colour or made of a contrasting material in order to make it easy to find the lift. Controllpanels in lifts should be standardized. There should be uniformity regarding the design and placing of the control buttons. The button to bring the lift to the entrance-floor should differ in form and colour from the other buttons. Above or on every button there should be clearly defined figures done in relief 15 mm high. Buttons or panels lit from the inside is a good solution.



Floor numbers on the inside of the lift doors should be "readable" by touch. In public buildings the different floors should be announced verbally. A tape-recorder, for example, could be used. There should also be an acoustic signal which sounds when the intended floor has been reached. If several lifts are adjacent to each other in battery form, each lift should have its own signal so that one knows which one of the lifts is coming, and in which direction it is going.

SPECIAL SECTION



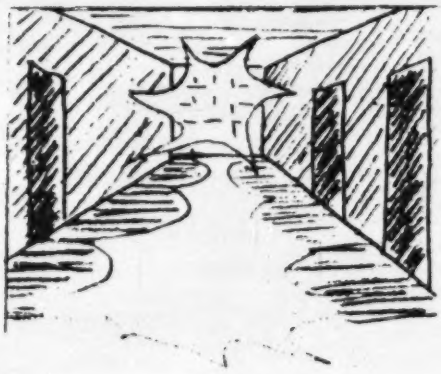
Light

The visual experience

The basic condition for our visual experiences is that we have light. Light influences sight if it lies within the visual wavelength field. It is the variation in the radiation strength and wavelength that causes us to experience differences in lightness and colours.

The visual experience can be a combination of the difference in contrast between light and colour provided that the strength of light is sufficient. Otherwise we only experience the differences in contrast between black and white.

Light is of great importance both to people with poor eyesight, and to those with varying remnants of vision. Suitable lighting-schemes in combination with the right materials and choice of colours can make visual experience more easy.



For those with poor eyesight the light situation is complicated by a number of factors, which is a result of, among other things, the need for more light, and greater sensitivity to dazzling. One must therefore have high demands on the spread of light, contrast, and shielding against dazzling. In general light colours should be used.

When planning, one should bear in mind that large sources of daylight can result in large variations in luminance which can cause dazzling. In rooms, without daylight, or with small sources of daylight, which are adjacent to areas with large sources of natural light, the lack of daylight should be compensated for by raising the level of the artificial lighting. This should be done in order to make the adaptation from high to low levels of lighting more easy.

Materials

Base the choice of materials on their characteristics. A wrong choice of materials can cause discomfort. A floor with a high mirroring factor can cause irritating reflections from ceilinglamps, which in turn can cause sight diminishing dazzling, and thereby a risk of accidents.

Colour

In choosing a light-fitting one should bear in mind that its colour characteristics should have such a spectral combination that colours will be reproduced naturally. The choice of colours and materials should be made in light from the source of light in which they are to be used.

It is important to know that the eye is only sensitive to colour experience provided that the strength of light is sufficient.

As to colour schemes contrasting effects should be used to underline the visual experience of a room and its parts, and to facilitate safe orientation.

Lighting schemes

Fitments should be chosen with a knowledge of how they spread light, and at the same time how they shield from dazzling. In order to make orientation easier, one requires a certain type of lighting scheme where the spread of light, together with lighting, materials and colour contrasts, contribute towards separating different surfaces.

Work requires a suitably balanced spread of light on work-surfaces and their surroundings, and places high demands on contrast and freedom from dazzling. The colour characteristics of the sources of light should be chosen so that colours will be reproduced naturally.

Mixed light, with too great differences in spectral combination, should not be tolerated.

For office and reading work for example, one should demand at least 90 % contrast between the text and the paper. Decisive for good contrast is that the direction of lighting is correct, and that there is a level spread of light within the central field of vision.

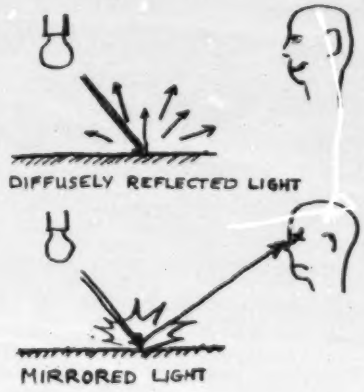
Two types of light are necessary for good work-lighting, general light, and directed light. The best contrast is achieved when the directed light comes from a point behind the left shoulder for right-handed people, and from behind the right shoulder for left-handed people. In this way a favourable vector – the direction of the fall of light on the reading surface – is achieved, which is decisive for good contrast. This form of lighting lessens the risk of dazzling in the peripheral field of vision, a factor which often contributes to poor vision.

In general one should choose and place light fittings so that they do not cause dazzling, neither direct nor by reflection. A suitable lighting scheme can eliminate the risk of accidents at critical points.

Three factors – luminance, dazzling and reflection, are particularly important in lighting-schemes.

The *luminance* (lightness) of a lighting or light-reflecting surface is the amount of light per m^2 of the lighting surface projected on a surface at right-angles to the angle of vision.

The *reflection factor* is the relationship between the light falling on a surface and the light reflected by the surface. The reflected light is not uniform. It can be divided up into diffusely reflected and mirrored light. High reflection factors and light colour-schemes influence the mean luminance and create light interiors. Low reflection and dark colour-schemes give the reverse effect.



Dazzling occurs when the contrasts are too great between light and dark areas within the field of vision: the eye is then exposed to stronger light than it is adapted for. Dazzling can also be direct, caused by, for example, a badly screened light-fitting, or indirect owing to reflexions from surfaces made of shiny materials.

Signs and sign-posting

The main demand is that one should be able to find the signs. They should therefore be set up at entrances, main circulation areas etc, before one comes to the area about which they inform.

It is important that also people with poor eyesight should be able to read the signs, sign-postings etc, otherwise the information on the signs have to be complemented by some other form of information such as verbal information.

Placing

Place the sign and post in such a position that it will not cause injury, for example at the side of circulation areas. Also place it in such a position that people who stop to read the sign will not be in the way. Do not place signs so that they project over circulation areas.

People with poor eyesight should be able to come close up to signs to be able to read them, or to "read them off" by touch. Wherever possible, place the signs at a height of 140 – 160 cm above the floor or ground level. Signs beside doors should be placed on the wall at the same side of the door as the door-handle. Signs above circulation areas should allow for clear headroom of at least 220 cm.

Design

The form of the sign itself can give information – an arrow, for example. The text should be clear and at least 15 mm high. This applies in cases where one can get close to the sign. Naturally when the sign has to be read from a distance then the text must be bigger. Letters, and above all symbols, should be in relief. If engraved letters are used, they should be coloured, and sufficiently large so that one can "read them off". In this case, however, the letters or figures must be considerably higher than 15 mm.

Materials

Materials should be suitable for "reading-off" by hand, that is to say that they should neither be rough nor sharp. Glass-covered signs do not only prevent people from "reading off" by touch, but they are also unsuitable due to their mirroring qualities. The latter applies to shiny surfaces in general. The sign (colour) should always have a mat, diffusely reflecting surface.

Light

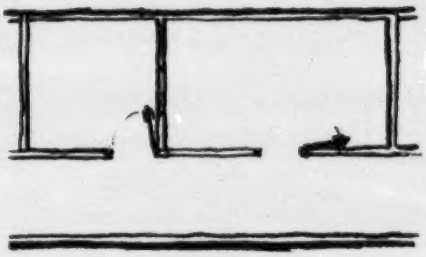
Signs can be directly or indirectly lit, or lit from within. There are also reflecting signs. It is important that the lighting and the material of the sign neither cause mirroring effects nor dazzling.

Colour

Signs should have good contrast between the text/symbols and the base, and the base and the background. Basically the same rules apply as in the section dealing with Colour. As far as signs are concerned stronger differences in contrast can be used. Black text on a white background gives the best result.

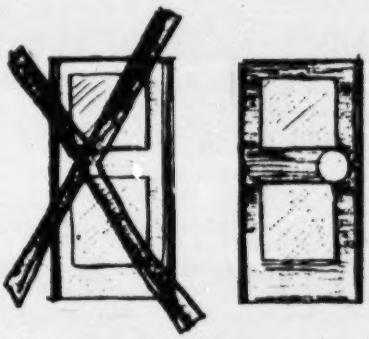
Doors, gates

The placing of doors is very important. They should preferably be hung so that they open with the main direction of traffic. That is to say from a busy area into a less busy one. When open, a door should be against a wall (90^{o} or 180^{o}).



Doors should, if possible, be equipped with door-closers, particularly in the case of doors opening into passages e.g. toilet doors. Mark off door-handles, and the "push" or "pull" side of the door by using different colours and materials.

Completely glazed areas, doors and windows should be marked by a band of different colour at a height of between 140–160 cm over floor or ground level.



Automatic doors opening against the direction of traffic are unsuitable, as are swing doors which swing beyond the neutral position.

Sliding doors are often to be preferred, both in the case of automatic doors, and doors for top cupboards, as in kitchens.

IMPORTANT POINTS – TO BE BORNE IN MIND WHEN PLANNING

- **Place important functions centrally!**
- **Use right-angled solutions!**
- **Break down large areas into smaller areas!**
- **Design pedestrian circulation routes so that they are easy to follow!**
- **Place and design furnishings and fitments in such a way that they will not cause injury in the event of a person colliding with them!**
- **Design handrails so that they give good directional guidance!**
- **Make sure that controls and light-switches can be used by people with impaired vision!**
- **Make maximum use of contrasting colours and materials!**
- **Make sure that free head room is never less than 220 cm!**
- **Check the way in which the doors are swung so that they do not become obstacles!**
- **Place and design signs and sign-posting in such a way that they can be read by people with impaired vision!**
- **Make sure that sources of light do not cause dazzling!**
- **Make lighting and colour work in combination with each other!**
- **Make sure that light at working places gives a contrast of at least 90% between text and paper!**
- **Use colours also to give directional guidance!**
- **Complement optical signals with acoustic signals!**

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